Leachate water quality of soils amended with different swine manure-based amendments

K.S. Ro, J.M. Novak, M.G. Johnson, A.A. Szogi, J. A. Libra, K.A. Spokas, and S. Bae

ABSTRACT

In the face of the rising level of manure production from concentrated animal feeding operations (CAFOs), management options are being sought that can provide nutrient recycling for plant growth and improved soil conditions with minimal environmental impacts. Alternatives to direct manure application are composting and thermochemical conversion which can destroy pathogens and improve handling and storage. The effect of four forms of swine manure-based soil amendments (raw, compost, hydrochar, and pyrochar) on soil fertility and leachate water quality characteristics of a sandy soil were investigated in soil incubation experiments. All four amendments significantly increased soil carbon, cation exchange capacity and available nutrient contents of the soil. However, hydrochar amended soil leached lower amounts of N, P, and K compared to the other amendments including the control. On the other hand, pyrochar amended soil leached higher concentrations of P and K. Subsequent tests on the hydrochar for K and N adsorption isotherms and surface analysis via XPS suggested that these nutrients were not sorbed directly to the hydrochar surface. Although it is still not clear how these nutrients were retained in the soil amended with hydrochar, it suggests a great potential for hydrochar as an alternative manure management option as the hydrochar can be soil applied while minimizing potential environmental issues from the leaching of high nutrient concentrations to water bodies.